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ABSTRACT

The workbook of field ecology is for use by high school science students participating in two and one-half day weekend trips to Acadia National Park, Maine, as part of Project Adventure, an interdisciplinary program aimed at educating the whole student through experienced-based learning in academics and a physical education program in the outdoors. Physical education activities during the weekend include hiking, rappeling, and cliff climbing. Academic activities rely heavily on observation and include the study of water, dams, fallen trees, beaver huts, rock slides, vegetation, ecological relationships, local history, seaweed, sand, animal life, ponds, and shoreline. A scavenger hunt is included which encompasses all aspects of the Park. Introductory material includes charts, maps, history of the area, and vocabulary. There is a follow-up exercise concerning student reaction to the weekend. The availability of additional information on Project Adventure is noted on the cover sheet. (SB)

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ACADIA: A Working Manual

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A Title III Project
Hamilton-Wenham Regional
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PROJECT PROJECT ADVENTURE

descriptors

Physical Education
Interdisciplinary Approach
Self Concept

target audience

Originally approved by the JDRP for students of all abilities on the high school level, the program has been successfully adapted to middle schools and upper elementary school grades. Parts of the program have also been applied in therapeutic and camp settings.

description

An interdisciplinary program involving experience-based learning in academics, along with group problem-solving and an alternative physical education program in the out-of-doors.

Project Adventure is designed to add an experience component to standard high school and middle school courses. For many students, learning is essentially a passive process offering them little opportunity to take responsible action or to test out abstract ideas in the real world. Project Adventure represents a combination of Outward Bound techniques and philosophy plus a humanistic group-process approach to learning and teaching. Small groups of students learn by actually working on specific reality-based tasks or problems in the community and the natural environment. The teacher's role is that of stating the problems and limits, giving students the responsibility for finding solutions. This approach has produced measurable improvements in self-concept, physical agility, and competence. It encompasses and supports a wide variety of teaching and learning styles.

The project is made up of two separate components, which may be used singly or together. These are: (1) a physical education program involving initiative games, outdoor activities, and a Ropes Course apparatus that can be constructed by teachers and students; and (2) an academic curriculum component designed to give hands-on experiences and a practical application of the "basics." The program's aim is to educate the whole student through sound academics, physical activity, and learning activities that enhance self-concept.

The project's strengths are its flexibility, the variety and quality of its curriculum models, and its ability to inspire and rekindle the enthusiasm of both teachers and students.

Training: The project offers teacher-training programs in both academics and physical education. These are intended to give teachers skills in program management, teaching strategies, and techniques necessary for implementation. Ideally, a core group of enthusiastic teachers from a single school attend a five-day workshop. Follow-up sessions and assistance with construction may also be part of the adoption process.

assurances/claims

Evaluation data (1971-72) shows that participation in Project Adventure significantly improved students' self-concepts and levels of achievement motivation as measured by the Tennessee Self-Concept Scale, the Ratter Scale of Internal vs. External Control, and a School Climate Survey. There has been measurable improvement of physical functioning on five of six measures. Students and parents see growing self-confidence and more active participation in school programs as outcomes.

implementation requirements

Attendance at the five-day workshop is essential. Ideally, one or more interested and enthusiastic teachers are trained in either the physical education or curriculum workshop, or both. (Both programs can be taught by teachers who are willing to try.) A second requirement is a supportive (or at least neutral) administration willing to incorporate new teaching styles and programs that may involve some flexibility in scheduling. No special facilities are required, although Ropes Course construction for the Physical Education program usually calls for some open space around playing fields or in a wooded area. No special staffing is required.

financial requirements

Typical costs for most adoptions include a five-day residential teacher-training program (approximately $175 per teacher for room, board, and materials; travel costs not included). For the Physical Education component, schools should allow a minimum of $1,800 for Ropes Course materials (actual costs vary). For the academic component, costs may include transportation, substitutes, camping equipment, etc., depending on the curriculum developed.

services available

An NDN-funded Developer/Demonstrator project.

Awareness materials are available at no cost. On-site visitation is welcome by appointment. A slide/tape can also be rented from the project at a nominal fee. Written curricular and evaluation materials are available at modest cost. Five-day residential training workshops are conducted at the project site. Workshops can be held at local sites out-of-state (project staff costs must be paid). Project staff is also available for awareness presentations and conferences (usually, travel and expenses are shared). The project offers implementation follow-up services on a limited basis (ordinarily, expenses are shared).

contact

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Compiled Fall 1978

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I.

THE GEOLOGIC HISTORY OF MT. DESERT

The geologic history of the Mt. Desert area begins about 450 million years ago. At that time, the area was covered by a warm, shallow, inland sea. Surrounding it were many active volcanoes. You might keep in mind that recent evidence suggests that this part of North America was connected to Europe and that the continents have drifted apart.

Limestone and volcanic ash were deposited in the sea. Sometime later, the area was subjected to intense pressures and the limestone and ash were changed into marble and a rock called tuff. Other sediments were changed into schists and gneiss. The schist is a finely layered rock that splits readily along the layers. The gneiss is a banded rock that does not split readily along the layers. See top half-page drawing - a. These rocks are known as the Bartlett Island Series.

About 400 million years ago, the volcanoes started erupting violently. Thick layers of volcanic ash accumulated and were again compressed into tuff. The layers are well bedded and stratified. Therefore, it is believed that they were sorted by wave action. Again, mild folding and recrystallization took place. More erosion and levelling took place. The rocks that were formed during the period are known as the Cranberry Island Series.

Once again, a shallow inland sea spread over the area and eroded the Cranberry Island Series of rocks. Many of these rocks were eroded into cobblestones of various sizes. This new material formed a conglomerate of sand and pebbles. Above the conglomerate are found hundreds of feet of sand and silt. These materials formed a light gray and green siltstone which splits readily along the bedding planes.

After these rocks formed, a magmatic phase took place. This was about 350 million years ago. At this time, magma, a hot liquid material was squeezed into areas of greatest weakness; that is, along the layers and into the fractures that were present in the sedimentary rocks. Some of the liquid material may have been extruded on the surface as lava. Much of it was squeezed between the layers of sedimentary rocks and formed features known as sills. Some igneous material was forced into vertical fractures and formed features called dikes.

The magma that was in contact with the overlying rock baked the overlying material and changed it into a new rock called hornfels. Loss of heat caused the magma to crystallize quickly into a very fine grained rock. Where the cooling took place slowly, large crystals had a chance to form.

The congealing magma formed two predominant mineral types. One is a heavy, dark-colored series that includes olevine, hornblende, and pyroxene. The other group is light-colored and consists of feldspar and quartz. The magma mass was so large that convection currents were operating and these currents allowed the separation of larger crystals from smaller ones so that a layered structure developed.

After the mass solidified, a second magmatic invasion took place but this material had the composition of granite. The invasion took place with much fracturing of the overlying rock. Some of the pieces of the rock fell into the liquid magma and were frozen in place as the magma hardened. The granite that formed from this magma has a relatively fine-grained structure that indicates that it cooled fairly rapidly.

The next period is difficult to interpret, but there is evidence of periodic uplift and erosion of the area. Lowering of the area about 350 million years ago allowed the Mt. Desert area to be covered with thousands of feet of sediments. However, erosion has stripped most of these away.

Sometime later, the Mt. Desert area was changed drastically in an unusual way. Look at the bottom half-page drawing as you recall this section. Several miles beneath the earth's surface, a huge reservoir of fluid magma worked its way upward. As the liquid ate its way upward, the rocks above the chamber were weakened and fell into the magma chamber. The magma squirted up between the walls of the chamber and the roof rock that fell in. This sequence is shown in figures A-C of the bottom drawing. This material crystallized into a coarse-grained pink granite that makes up much of Mt. Desert Island. The breaking and collapse of the roof of the chamber was not clean cut. There was much shattering of the rocks at the edge of the break. Much of the shattered rock can be seen as a continuous zone of breccia along the granite boundary. These rocks are found in the shelter zone on your map.

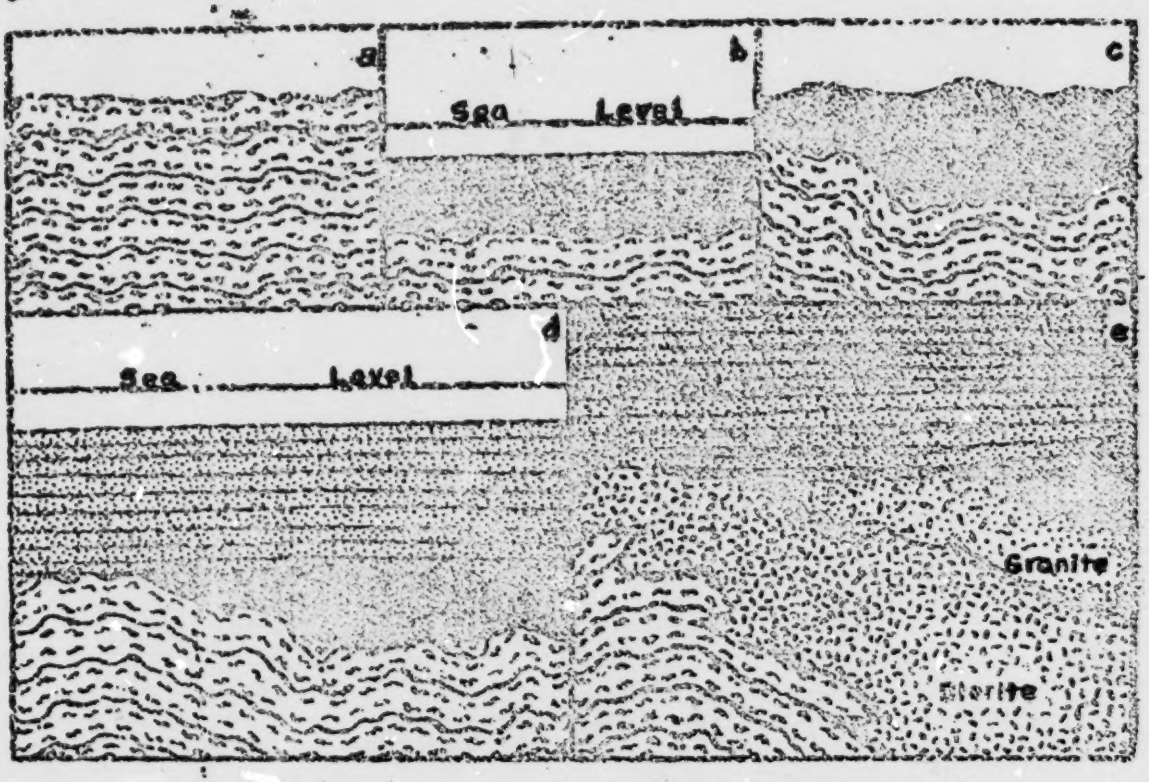
Out beyond the wall of granite, arc-like cracks were filled with magma which solidified into a finer grained rock because it cooled relatively rapidly. These features are known as ring dikes because they form almost a continuous ring around the granite intrusion.

At a later time, similar events to those described above took place again. These rocks are labeled younger granite in the bottom drawing, D-F. This granite material remained relatively stable but has been eroded greatly since its formation. It is this erosion surface that we see when we visit this area.

Weathering and erosion have been so complete that by the Cretaceous Period, about 125 million years ago, the area had been worn down to an almost featureless plain. About 60 million years ago, the land was uplifted and tilted towards the sea. Rivers were reactivated and cut river valleys that were roughly perpendicular to the coast. Sediments carried by the rivers were deposited in the sea on what is now the continental shelf. Sea level changes caused flooding of these valleys and created bays and estuaries.

About one million years ago, glaciers covered nearly all of Canada and much of the northern United States. The ice was several thousand feet thick near the center of the ice sheet but was thinner in the Maine area. The ice flowed over the relatively flat plain of Canada and northern Maine, but was slowed up as it confronted the resistant Mt. Desert area. The ice piled up behind the Mt. Desert area and then began to spill out as fingers of ice. These "fingers" were about 1,000 feet thick and several miles long. The ice had tremendous erosive power. The existing valleys were enlarged and the V-shapes of the river valleys were rounded into gentle U-shapes. The ice extended several miles past

the present shoreline. When the ice melted and the glaciers retreated, sea level rose and flooded the glacial valleys. A look at the map shows the linear arrangement of these valleys. Features like these are known as fjords but the bays in Maine are not quite deep enough to be considered true fjords. The sea pounding on the coast has modified the area greatly. Features such as Thunder Hole are only possible because of the geologic history of the area. As you travel over the area, look at the geologic map and try to observe how the rock and elements have combined to form this unique area.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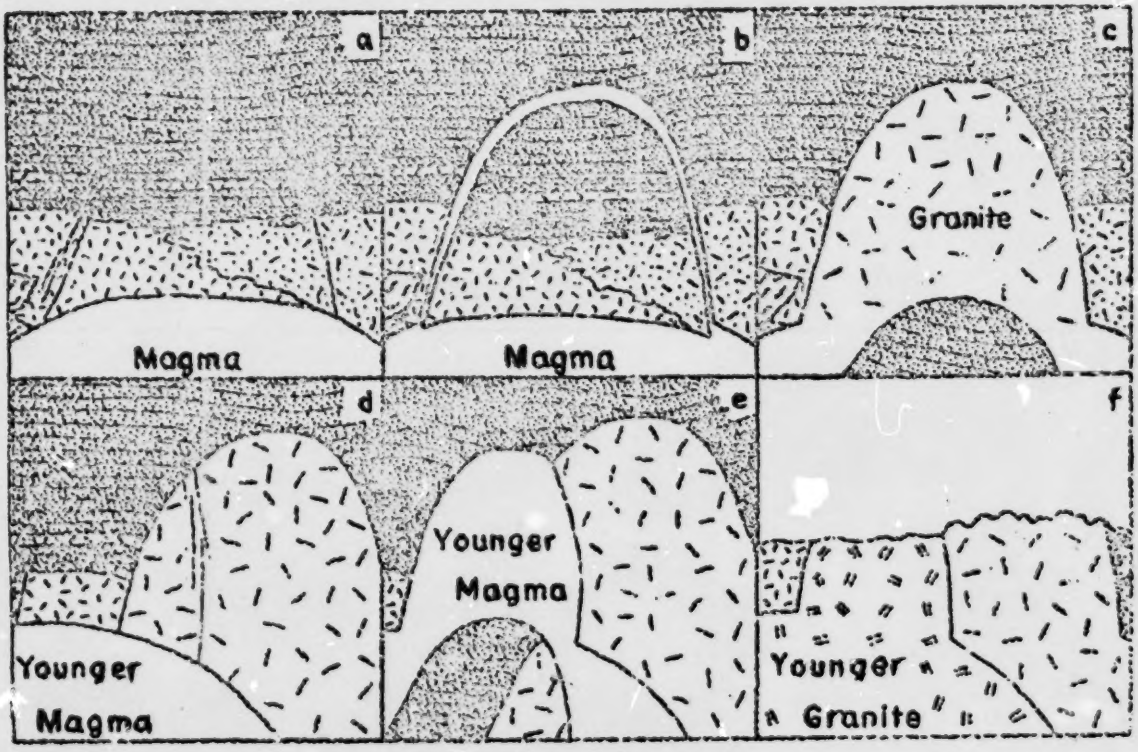
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SCAVENGER HUNT

Each group should find examples of the following items and note a short description of them when found. Do not collect these items, but do show them to your group leader. He will give your group credit for having found them. The Scavenger Hunt includes the entire Acadia Park and it can be completed within the time limit of our visit.

1. two types of lichen
2. an example of insect damage
3. an area where erosion has taken place
4. a million living things
5. an example of an animal home
6. two types of animal tracks
7. an example of condensation
8. two different types of animal scat (droppings)
9. a parasitic plant
10. an example of how man has abused the land
11. the effects of wind
12. a dead animal
13. three types of wild flowers identified by name
14. three different evergreen trees
15. two types of seaweed
16. a crab
17. a mussel or clam
18. hawk or eagle
19. osprey
20. sea anemone
21. starfish
22. sea urchin
23. barnacle
24. two edible beach plants identified by name

HIKING

The Gorge, The Tarn, Sieur de Monts Spring, Dorr Mountain
Cadillac Mountain, Ridge Trail, Eagles Crag

During the day you will be hiking from the Blackwood Campground to the summits of Dorr and Cadillac Mountains. A number of different sites will be visited. Specific questions will be found under appropriate headings. There are also questions concerning the trail which will be found in sequential order. If your group goes toward the Tarn first, you should proceed with questions as typed. If your group goes up the Cadillac Ridge first, questions must be answered in reverse.

As you climb from the base to the summits of the mountains and return to camp, you will notice some changes which occur both in the biotic (living) and abiotic

(non-living or physical) environments. There will be approximately three general areas or zones of change to be on the lookout for: (1) the base-woodland (2) the intermediate ascent which has several observable zones within it and (3) the summit.

These three zones can be detected on both Dorr and Cadillac Mountains.

General Questions - These questions should be read ahead of time, notes taken during hike, and questions answered generally after hike.

1. During the entire hike, note the different plant forms. Discuss the different plant adaptations due to change in altitude, physical factors, exposure, etc. For example, many trees just before the summit may show stunted growth. What factors cause this to occur? Give specific examples of plant adapatations for each zone of the mountains.

2. Look for evidence of animal life - the beast, prints, scat, remains of food, holes, hair or feathers, etc. Describe specific examples that you find along the way.

3. Study protected and unprotected areas. Micro-communities can be found in isolated areas. Describe why this is so and give examples of some micro-communities found.

4. Dorr and Cadillac are both relatively small mountains for New England, yet conditions, both biotic and abiotic, can be observed here that would normally be expected only at higher altitudes. Explain.

Specific Questions

Leave Blackwood Campground. Proceed toward Bar Harbor on Rt. 3.

1. After you pass a small church-like building on the left, identify the peaks ahead on the right.

2. The road passes through a notch formed by these peaks and what other peaks?

3. Based on information gathered along Rt. 3, what does Maddy caddy?

4. On the left you have identified the two peaks. Describe the differences between the two summits from here.

5. Note the trees in the valley on the left of Rt. 3. Describe the variations in height. Explain.

Across from Otter Cliff Road, there is a guard rail on the left side of the road. Trail head is at the bottom of the embankment at the 23rd post. You should proceed along this trail to the Gorge Trail which leaves to the right.

6. It would not be adviseable to drink water from the brook which follows the trail to the left. Explain.

Shortly after beginning down the trail, you will reach a small pond. The trail will cross over a dam.

7. Who built the dam? Why? Is it still functional?

A short distance from the pond, the Gorge Trail will leave to the right. Proceed down this trail 1.4 miles to the Tarn.

Along this trail you will come to a large fallen tree.

8. What caused this tree to fall? Note other fallen trees in the area. Why are they all in the same direction?

Note third beaver hut.

9. Why is this area so popular with beavers?

The Tarn

1. Describe what is meant by "the tarn".

2. Describe the vegetation on and among the rocks.

3. How many different types of lichen can you identify?

4. What is the name given to the process by which a given community gradually changes until it is recognized as a different community?

5. Across Rt. 3, note rock slides off Huguenot Head. What is the main cause of these slides?

Look for signs which will enable you to answer the following questions:

6. Who was John Innes Kane?

Continue straight on trail toward Sieur de Monts Spring.

7. Who were Morris K. and Maria DeWitt Jesup?

Sieur de Monts Spring

A. Abbe Museum

The Abbe Museum is a privately owned exhibit of the Eastern Woodland Indians. It contains prehistoric stone, bone and shell arti facts. If the museum is open, visit the exhibits.

What impresses you most about the lifestyle of the Indians? How does their life compare with yours?

B. Wild Flower Garden

The wild flowers found in the garden are those which you will likely see while hiking Dorr and Cadillac Mountains.

Be sure to note carefully the following:

Pitcher Plant	Mountain Cranberry
Blueberry	Sheep Laurel
Labrador Tea	Heather Leaf
Mayflower (Arbutus)	Cinquefoil

Dorr Mountain Trail

The trail head to the summit of Dorr Mountain can be found directly behind Sieur de Monts Spring.

1. This trail is unique. Describe how it differs from other trails you have been on.

While climbing, be sure to note the changes in plant and animal life.

Be cautious not to lose trail above tree line.

2. What methods are used to mark the trail above the tree line?

Summit of Dorr Mountain

1. What is the altitude of Dorr Mountain?

2. Look carefully! Describe the primary animal life at the summit.

3. Explain how soil (not rocks) develops in the summit area.

To the north, you should be able to identify the town of Bar Harbor. Close offshore, one can observe five small islands.

4. Identify these islands by name from left to right.

Proceed to Cadillac Mountain by way of the Ravine.

Summit of Cadillac Mountain

1. What is the altitude of Cadillac Mountain?

2. What is the endless struggle which Acadia National Park is confronted with?

3. Who was Stephen Tyng Mather?

Follow the Cadillac Ridge trail toward Eagle Crag. Be very careful to follow the trail. It is very easily lost.

1. Why is so little vegetation observed on the ridge?

2. Describe the appearance of vegetation which is present.

You should come to a crossroads near a small mountain pond.

3. Describe the plants and animals which can be observed living in and around this pond.

Follow trail to Eagle Crag. Note small bogs on left on narrow ridge as you proceed along trail.

Shortly after beginning down Eagle Crag Trail you will observe great mats of lichen on either side of trail.

4. Describe these mats.

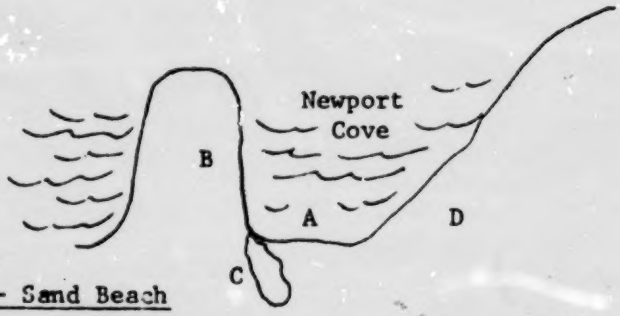
5. What is Eagle Crag?

Continue along trail back toward Blackwood Campground.

SAND BEACH

The Sand Beach area can be easily divided into four different distinct regions. Note diagram below.

Region A is the Sand Beach itself. Region B is the left side of the cove and includes the rocky coastline and Great Head. Region C is the small pond behind the beach. Region D is the rocky coast to the right of Sand Beach.



Region A - Sand Beach

1. While on the beach you should try a little digging in the sand to determine the type of animals existing in this area. List below any which you observe and/or see signs of (bodies, tracks, droppings, etc.).

2. What is a "pocket beach"? How is it formed?

3. Note the line where sand color changes. Examine the sand carefully.

   a. Describe the sand in both areas. Differences?

   b. How does it differ from sand you may have seen before?

   c. Any signs of animal life in the sand?

   d. What type of material did this sand originate from? Composition?

   e. If there is variation in color, explain why.

   f. What are the most common shapes of the sand particles?

   g. Does size of grain indicate anything?

4. Describe in one word the temperature of the water.

   Actual temperature:

Region B - Left side of Cove and Great Head

Proceed to the far left side of beach (facing ocean).

1. There are usually piles of kelp (sea weed) in among the rocks. Examine these carefully. Is any animal life present? If so, explain why.

2. Describe the shoreline in Region B. How does it differ from that in Region A? Explain why this is so.

Follow the Great Head trail to the top of the hill and cliff overlooking the Newport Cove.

3. Describe the vegetation in this area. What effect has the ocean environment had on it? Explain by giving specific examples.

4. From the top of Great Head, look out over the whole Sand Beach area.

   a. Describe the pond behind Sand Beach (shape, size, etc.)

b. What is the name of the roundish mountain directly behind the pond?

c. What is the name of the small rock island just off Great Head in Newport Cove?

d. Describe and explain the differences in water color observed from here.

Proceed back down Great Head trail to the shoreline at Region B.

Region C - The Pond

1. What is the source of water in this pond? Be careful.

2. Describe the shape of the inlet which connects the Pond with the ocean. Speculate as to what causes it to be shaped this way.

3. Taste the water in the pond. How salty is it? Compare with ocean.

4. What is the primary producer in the pond? How does it get here?

5. What is the primary producer on the edge of the pond?

6. What animals might inhabit or feed in this pond? Give signs which you observe.

7. Explain the presence of large quantities of driftwood here but relatively little on the beach.

Region D - The Right Shoreline

1. Describe how the shoreline here differs from that at Region A and Region B.

2. Describe life forms. Primary producers? Consumers?

5. Having rappeled and climbed the cliffs, now what are your feelings?

THE BEACH AT OTTER COVE

When you walk along the park loop road (Ocean Drive) from Blackwood Campground to the Otter Cliffs or Sand Beach area, you will reach a point where the road crosses the water. On the ocean side is Otter Cove. The beach on Otter Cove is rich with beach plants.

1. Describe the types of vegetation found along the shore.

2. What kind of animal life is present?

3. Describe the kinds of life which can be observed in the water.

REFLECTIONS

Remove this sheet and take it home with you. When you get home, think about what you have done this weekend and what it has meant to you. Sometime before you come back to school, write your answers to the questions below and bring them with you.

1. What was the one thing that impressed you the most during the expedition?

2. What are some of the general things or concepts that you have learned as a result of the expedition?

3. What are your comments about working together in a group during the expedition?

4. Now that you are home, what is your reaction toward the entire expedition?